

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1. (Currently Amended) A method for managing a network providing Input/Output (I/O) paths between a plurality of host systems and storage volumes in storage systems, comprising:

providing an application service connection definition for each of the I/O paths from a host to a storage volume;

providing at least one service level guarantee definition indicating performance criteria to satisfy service requirements included in at least one service level agreement with at least one customer for network resources;

associating each service level guarantee definition with at least one application service connection definition;

gathering, by a virtualization controller mapping physical storage resources to virtual volumes in a virtualization layer, Input/Output (I/O) performance data for I/O requests transmitted through the I/O paths;

transmitting, by the virtualization controller, the gathered performance data to a service level agreement server;

determining, by the service level agreement server, performance data maintained for the application service connection for which the gathered performance data was received;

updating, by the service level agreement server, the determined performance data with the performance data received from the virtualization controller;

monitoring, by the service level agreement server, whether the performance data for application service connections indicating the I/O requests transmitted through the I/O paths satisfy the performance criteria indicated in the service level guarantee definition associated with the application service connection definitions for the I/O path; and

transmitting, by the service level agreement server, commands to the virtualization controller to throttle I/O transmission over at least one connection in response to determining that the performance data for at least one application service connection for the connection does not satisfy the performance criteria.

2. (Previously Presented) The method of claim 1, wherein each service level guarantee definition is implemented as a separate element in at least one Extended Markup Language (XML) document, the element for the service level guarantee definition includes the performance criteria defined in the service level agreement, and wherein the application service connection definition for each of the I/O paths is implemented as an element the at least one XML document, wherein attributes of the application service connection definition element provide information on the I/O path.

3. (Original) The method of claim 1, wherein multiple service level guarantee definitions indicating different performance criteria are associated with different sets of application service connection definitions.

4. (Previously Presented) The method of claim 3, wherein the application service definition for the I/O paths may be associated with the multiple service level guarantee definitions, wherein the monitoring comprises determining whether the I/O requests transmitted through the I/O paths satisfy the performance criteria of all associated service level guarantee definitions.

5. (Previously Presented) The method of claim 1, further comprising:
providing an application service group identifying a plurality of application service connection definitions, wherein associating the at least one service level guarantee definition with the application service connection definitions comprises associating the at least one service level guarantee definition with the at least one application service group, wherein the application service connection definitions identified in the application service group are associated with the service level guarantee definition with which their application service group is associated.

6. (Previously Presented) The method of claim 5, further comprising:
providing a service level commitment record associating one service level agreement definition with the at least one application service group.

7. (Previously Presented) The method of claim 5, wherein at least one Extended Markup Language (XML) document includes one element for each of the at least one application service group, and wherein the element for each of the at least one application service group includes one sub-element for each application service connection definition included in that application service group, wherein each application service connection definition subelement includes attributes providing information on the application service connection definition.

8. (Previously Presented) The method of claim 1, wherein monitoring whether the I/O requests transmitted through the I/O path satisfy performance criteria indicated in the service level guarantee definition comprises:

- gathering performance information concerning I/O requests for the I/O paths;
- selecting one of the at least one service level guarantee definition; and
- for each of the I/O paths identified by the application service connection definition associated with the selected service level guarantee definition, comparing the gathered performance information for the I/O path with the performance criteria indicated in the selected service level guarantee definition.

9. (Original) The method of claim 8, further comprising:

- adjusting operations among the I/O paths represented by the application service connection definitions associated with the selected service level guarantee definition if the gathered performance information for the I/O paths does not satisfy the performance criteria.

10. (Previously Presented) The method of claim 9, wherein adjusting the operations comprises:

- determining the I/O paths that are over performing and under performing with respect to the performance criteria; and
- throttling the transmission of the I/O requests through the determined I/O paths that are over performing.

11. (Previously Presented) The method of claim 10, wherein throttling the transmissions comprises delaying the processing of the I/O requests transmitted through the over performing I/O paths.

12. (Previously Presented) The method of claim 8, wherein the gathering of the performance information for the I/O paths comprises determining an I/O response time and I/O demand at the I/O paths and comparing the determined I/O response time and the I/O demand with the performance criteria for the I/O response time and the I/O demand in the selected service level guarantee definition.

13. (Previously Presented) The method of claim 12, wherein the I/O demand comprises I/O operations per second per unit of contracted storage capacity and I/O throughput per contracted storage capacity.

14. (Previously Presented) The method of claim 13, wherein one of the I/O paths is under performing if a percentage of I/O response times measured for the I/O path is less than a percentage guarantee indicated in the selected service level guarantee definition.

15. (Previously Presented) The method of claim 13, wherein one of the I/O paths is under performing if the I/O demand exceeds a demand criteria indicated in the service level guarantee definition and a sampling of the determined I/O response time is less than a response time criteria indicated in the service level guarantee definition.

16. (Canceled)

17. (Previously Presented) The method of claim 1, wherein the network comprises a Storage Area Network (SAN).

18. (Previously Presented) The method of claim 1, wherein the at least one application service connection definition, the at least one service level agreement, and the at least one service level guarantee definition, are provided by the service level agreement server in a web

service architecture that interfaces with a client to provide real time performance information on the I/O paths to the client.

19-49. (Canceled)